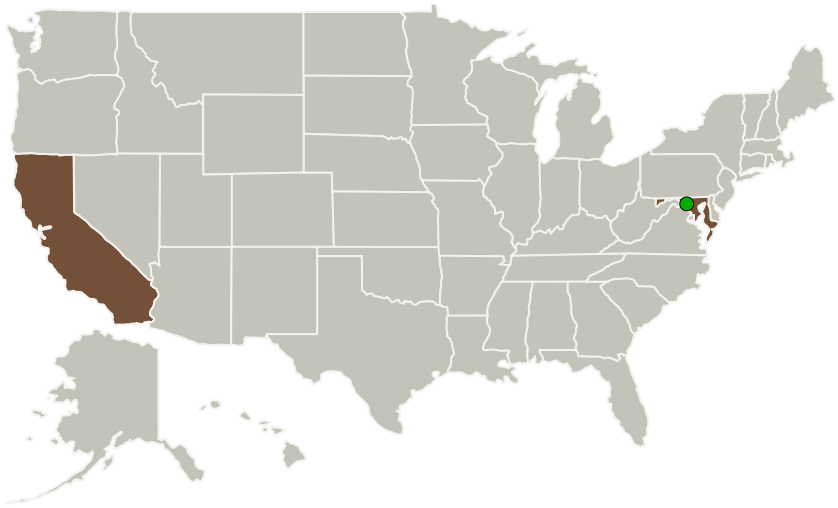
Celestial X-ray Source Modeling and Catalogues for Spacecraft Navigation and Timing, Phase I

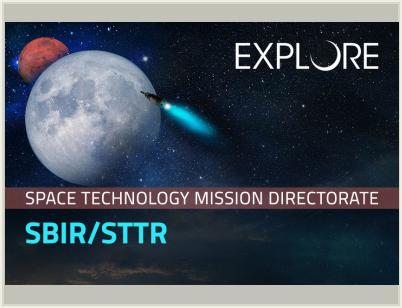
Completed Technology Project (2011 - 2011)

Project Introduction

The Microcosm X-ray pulsar-based navigation and timing (XNAV) team will provide the software and modeling infrastructure for NASA to support XNAV operations, focusing on detailed X-ray source modeling. These models can be used to evaluate the potential of using measurements of photon energy and/or aperiodic sources to improve XNAV performance. Key goals are: characterize X-ray sources for navigation purposes; automate pulse shape catalogue tools; automate XNAV/pulsar noise prediction tools; aperiodic source evaluation; photon energy performance enhancement; create integrated catalogs of XNAV guide stars and XNAV-applicable aperiodic sources; identify and document the key periodic X-ray source characteristics impacting the performance of the XNAV instruments and system. This comprehensive characterization categorizes and provides the necessary parameters regarding these celestial sources that make them beneficial for spacecraft navigation. Based upon past research work, specific information about each unique X-ray source must be attained in order for the source to yield its optimum capabilities. We will identify the appropriate parameters for characterizing aperiodic or transient sources for their use in navigation. Additionally, the existing X-ray source catalogue will be updated and enhanced. Phase II will focus on implementing these source models in detailed XNAV simulations and potentially creating flight software versions of these models.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Microcosm, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Hawthorne, California
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138030)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Microcosm, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

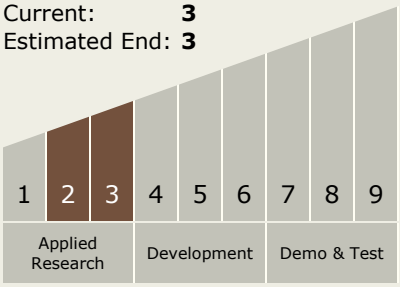
Carlos Torrez

Principal Investigator:

Paul Graven

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Completed Technology Project (2011 - 2011)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.4 Network Provided Position, Navigation, and Timing
    - TX05.4.2 Revolutionary Position, Navigation, and Timing Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System